NYBG

TWIN LAKES RESTORATION PROPOSAL
APRIL 2019

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The Twin Lakes at the New York Botanical Garden is….

- A place where the geologic history of North America is written in stone….
- A place where eleven ecological communities can be identified….
- A place where the natural resources sustained Native Americans for millennia….
- A place where wars were fought and industries were developed….
- A place where a great institution was built to study, preserve and celebrate the diversity of life on earth….

The Twin Lakes will be….

- A collaborative project drawing on expertise throughout the Garden and the community.
- A nature preserve, a classroom and a sanctuary.

INTRODUCTION

Storm water management, habitat restoration and access to high-quality nature experiences are urgent priorities as the world becomes more urban and the climate changes and grows more severe.

The United Nations declared the 2020s the decade of ecological restoration, recognizing that climate change and ecological degradation are inextricably linked. Similarly, the 2019 World Bank report, *Nature-based Solutions: a Cost-effective Approach for Disaster Risk and Water Resource Management*, promotes the use of “green infrastructure” (forests and wetlands) as an alternative to “grey infrastructure” (concrete and steel) to mitigate the risk from natural disasters.

In the US, the National Fish and Wildlife Foundation (NFWF) through its Long Island Sound Futures Fund has invested $19.6 million in 416 projects to restore critical fish and wildlife habitat, reduce pollution and engage communities throughout the Long Island Sound watershed, including the Bronx River.

At the state level, The New York City Environmental Fund (NYCEF) was created by the New York State Department of Environmental Conservation (DEC) to foster community stewardship of waterways, shorelines, parklands and open spaces in New York City.

Municipal agencies are also allocating significant funding for ecological restoration. In 2018, the Departments of Environmental Protection (DEP) and the Department of Design and Construction (DDC) began work on a $35 million project to improve drainage and enhance Jack’s Pond in the Great Kills neighborhood of Staten Island. The infrastructure upgrade will include the construction of catch basins and sewer upgrades that will direct storm water to Jack’s Pond, where it will be naturally filtered.

Like Jack’s Pond, the Twin Lakes area at the New York Botanical Garden is an opportunity to leverage public and private funding to manage storm water runoff and restore wildlife habitat using green infrastructure. Restoring the hydrology, naturally occurring ecological communities and connectivity between adjacent communities will have long-lasting and important benefits for the Bronx community and the global environment.

The successful development of the EcoFlora as the first-in-the-world large-scale flora project combining traditional botanical techniques with modern technology and robust community participation provides a foundation of success to implement the restoration of the Twin Lakes area and manage the landscape for maximum ecological function, diversity and educational value. The community at-large, including government, NGOs, local residents and participants from across the city will be engaged to envision a restored Twin Lakes natural area using scientific methods and the highest fidelity to the diversity, integrity and sustainability of the diverse ecological communities on the site.

Restoration of the Twin Lakes area at the New York Botanical Garden will address the aspirations and recommendations outlined above and amplify the NYBG’s commitment to sustainably managing the natural resources entrusted to it.

PROPOSAL SUMMARY

The ten wettest years on record in New York City have all occurred in the past several decades. During 2018, rainfall in New York City exceeded 65 inches-- 31% above normal. Today, eight roadway drainage structures outside of the Garden and at least twenty-five others within the Garden within the Watson/Library complex parking lots, roadways, and nearby grounds drain directly into the Twin Lakes via underground pipes. These waters, potentially containing salt and other contaminants should be filtered with a robust, green-infrastructure system before reaching the Bronx River and Long Island Sound. As proposed here, these collected waters will pass through at least four distinct natural ecological communities that will slow the water, settle particulates and allow a rich diversity of biological processes to breakdown chemical contaminants well before reaching the Bronx River.

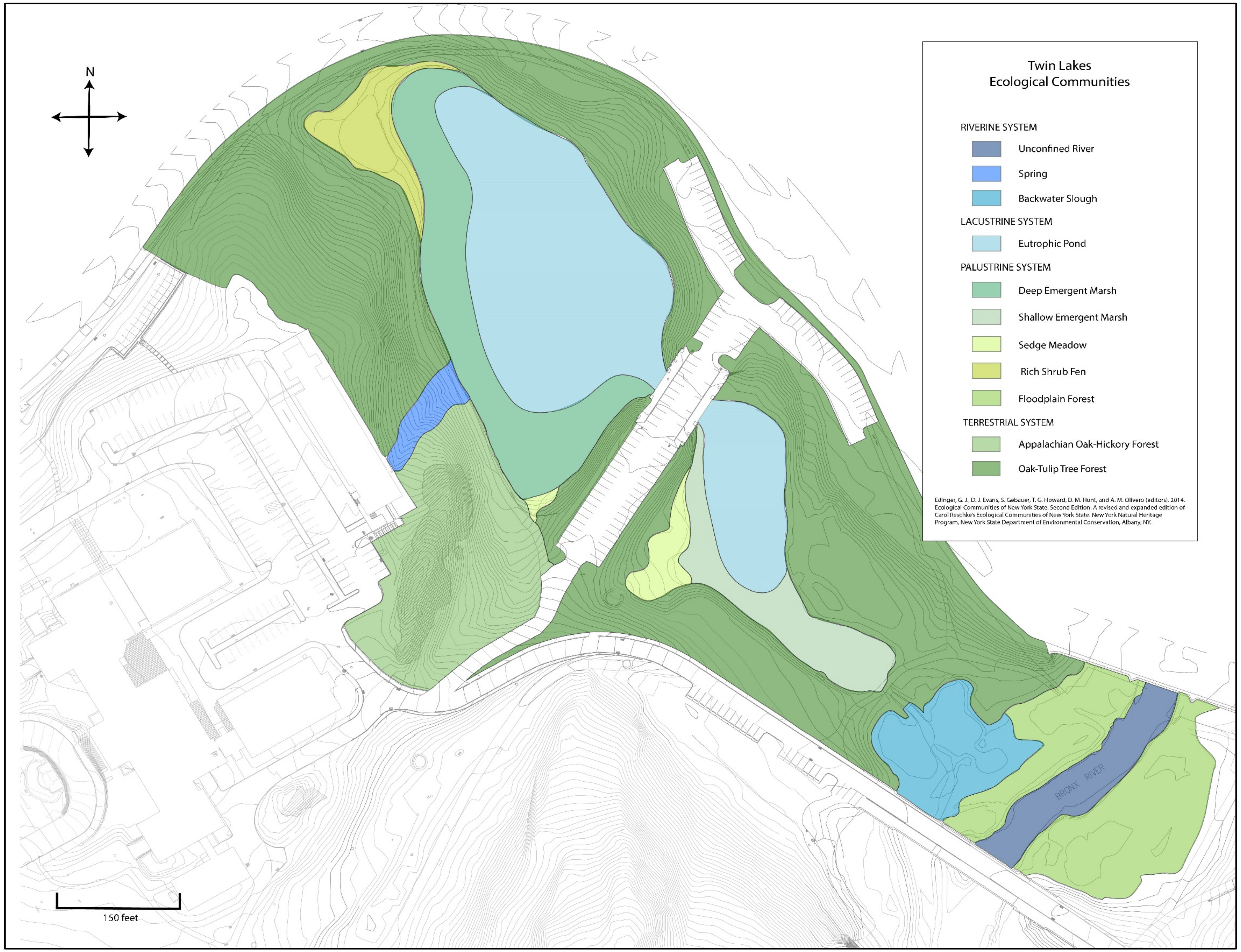
Identifying and eliminating new and existing invasives will be vital in effectively maintaining the ecological integrity and ecosystem function of the site. Robust plant identification training will be provided focusing especially on emerging invasives that pose a threat to the local ecology and New York City generally.

Federal, state and local budgets are available to fund projects focused on storm water management and invasive species control, allowing these liabilities to help fund mitigation efforts and diverse nature programming at NYBG.

Phase One
- planning
- invasive removal
- planting
- programming

Phase Two
- design and construction
- invasive removal
- planting
- programming

TWIN LAKES ECOLOGICAL COMMUNITIES



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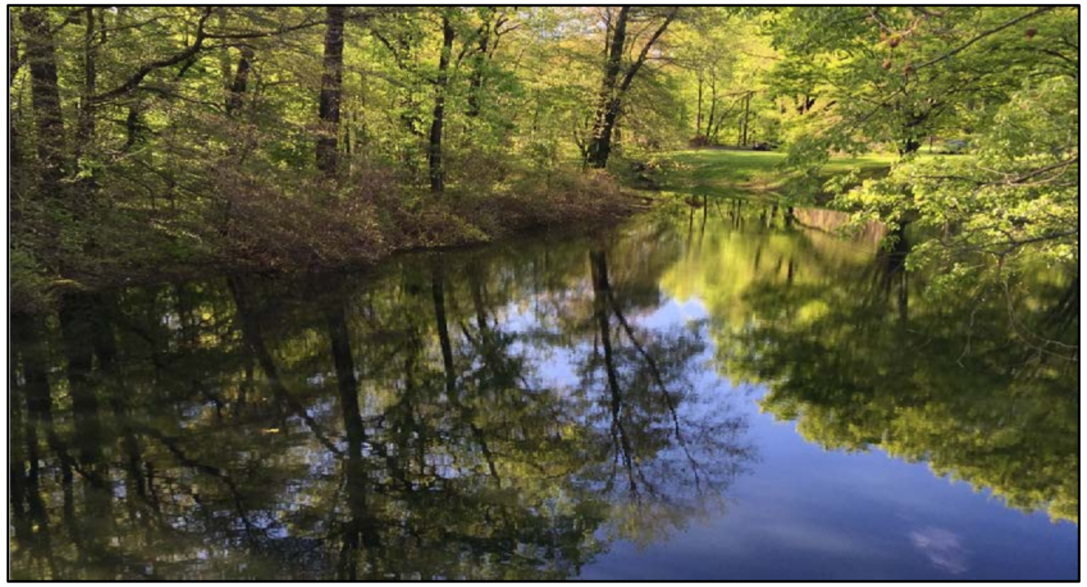
– Cameron's Line, the 450 million year-old fault separating North America from the oceanic plates to the east breaks the surface near the Pfizer Plant Research Laboratory forming a bold escarpment and the Twin Lakes valley below. Retreating glaciers filled the valley with cobble, sand and gravel through which the Bronx River formed a network of braided channels. Direct connection to Long Island Sound is via the Bronx River and the Hudson River watershed via Mosholu Creek and Tibbetts Brook. Although altered, much of the topography, vegetation and hydrology remains and can be restored.

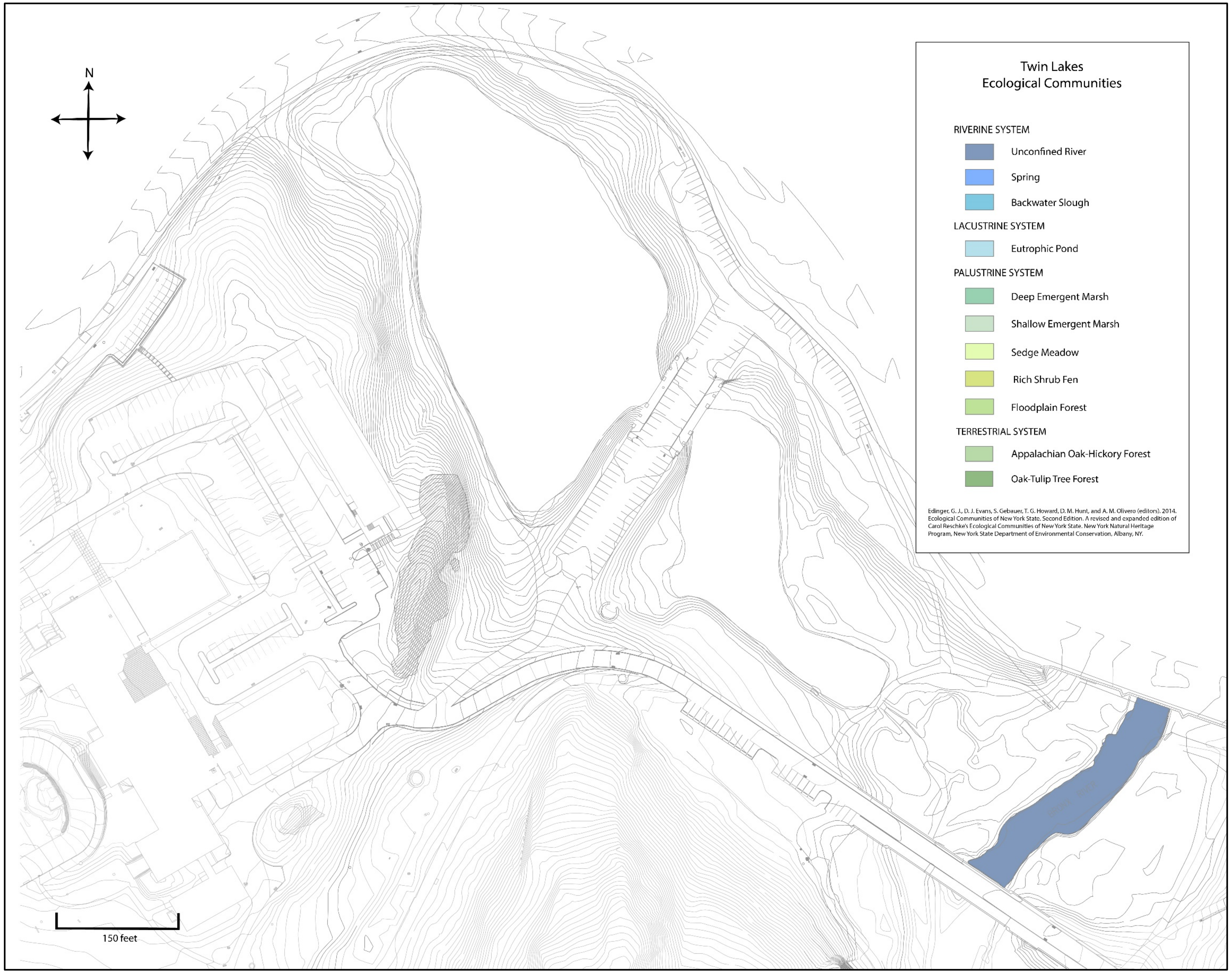
– 13.35 acres

– The nexus of two major watersheds, varied topography, springs and seeps with various exposures support a mosaic of ecological communities and a regional biodiversity hotspot. Since 1884, 661 plants and animals have been documented from the site, including rare and endangered animals and plants.

– Dutch and English settlers followed the Native Americans in pursuit of animal furs, shellfish and other natural products from the area. George Washington's army sought cover here prior to the Battle of White Plains. As a research and conservation initiative of the EcoFlora, the restored area will enhance and enlarge the NYBG's research, volunteer, education and public programs, especially the Naturalist Certificate Program.



UNCONFINED RIVER



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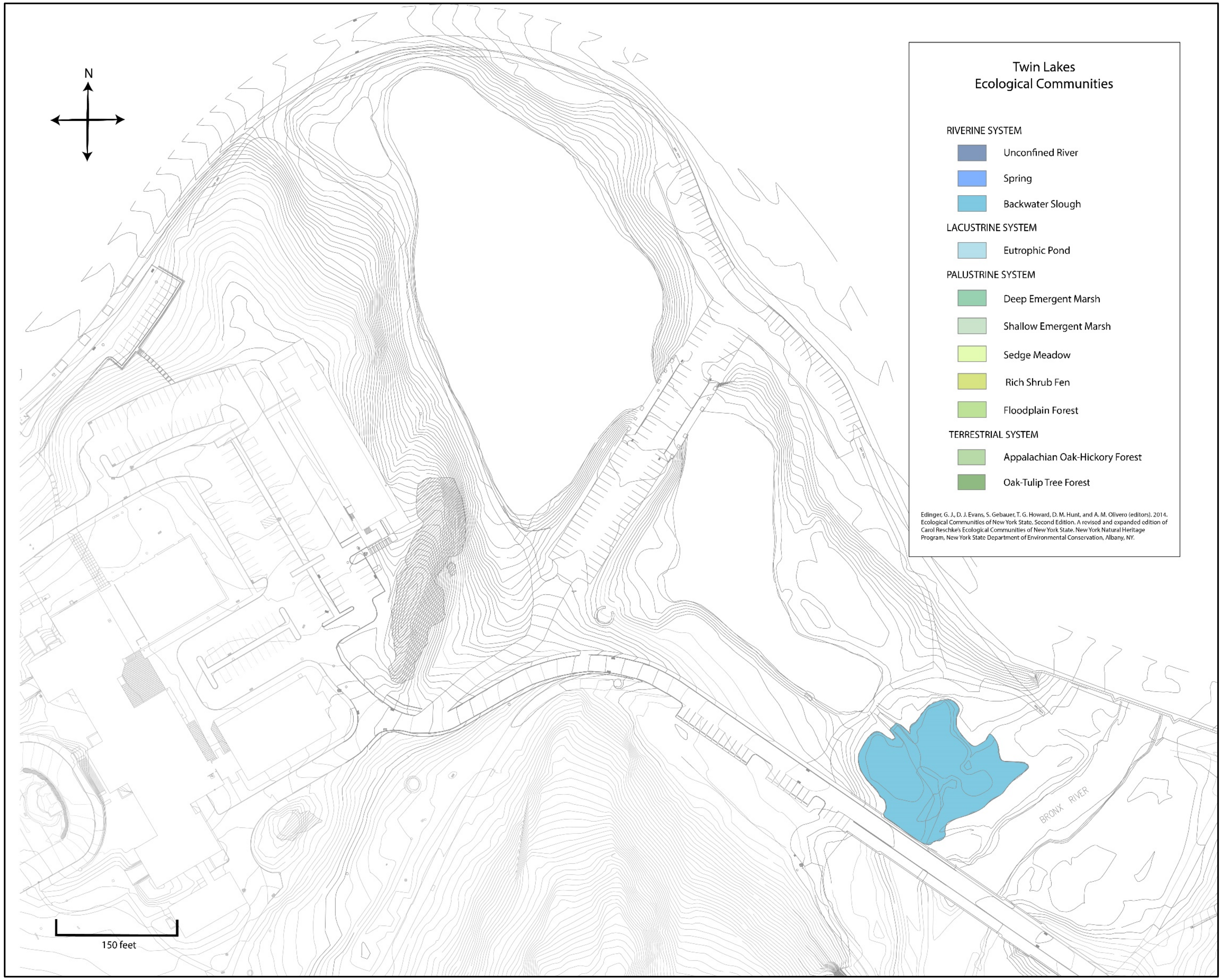
– The Bronx River is New York City's only freshwater river. It flows 23 miles south from its source in Valhalla, Westchester county to the East River and the western end of Long Island Sound. The course through the Garden is 0.9 miles and transitions from an unconfined river to a confined river through the gorge. The Bronx River is an important pathway for wildlife and links the human, plant and wildlife communities of Westchester and the Bronx.

– 0.29 acres

– Twenty-seven species of fish have been recorded including Eels, Herring, Shad and Bass. In 2014, two species of Pondweed were recorded for the first time.

– Ezra Cornell, the son of a potter and founder of Western Union and Cornell University was born at Williamsbridge, just north of the Garden. In addition to ceramics, the River supported numerous industries such as textiles, dye, tobacco and chemicals. Robert Moses straightened portions of the Bronx River, but not within the Garden. After two centuries of pollution and neglect, the Bronx community reclaimed the river and brought it back to life. It is a beloved natural treasure and physically links the many communities along its banks.

BACKWATER SLOUGH



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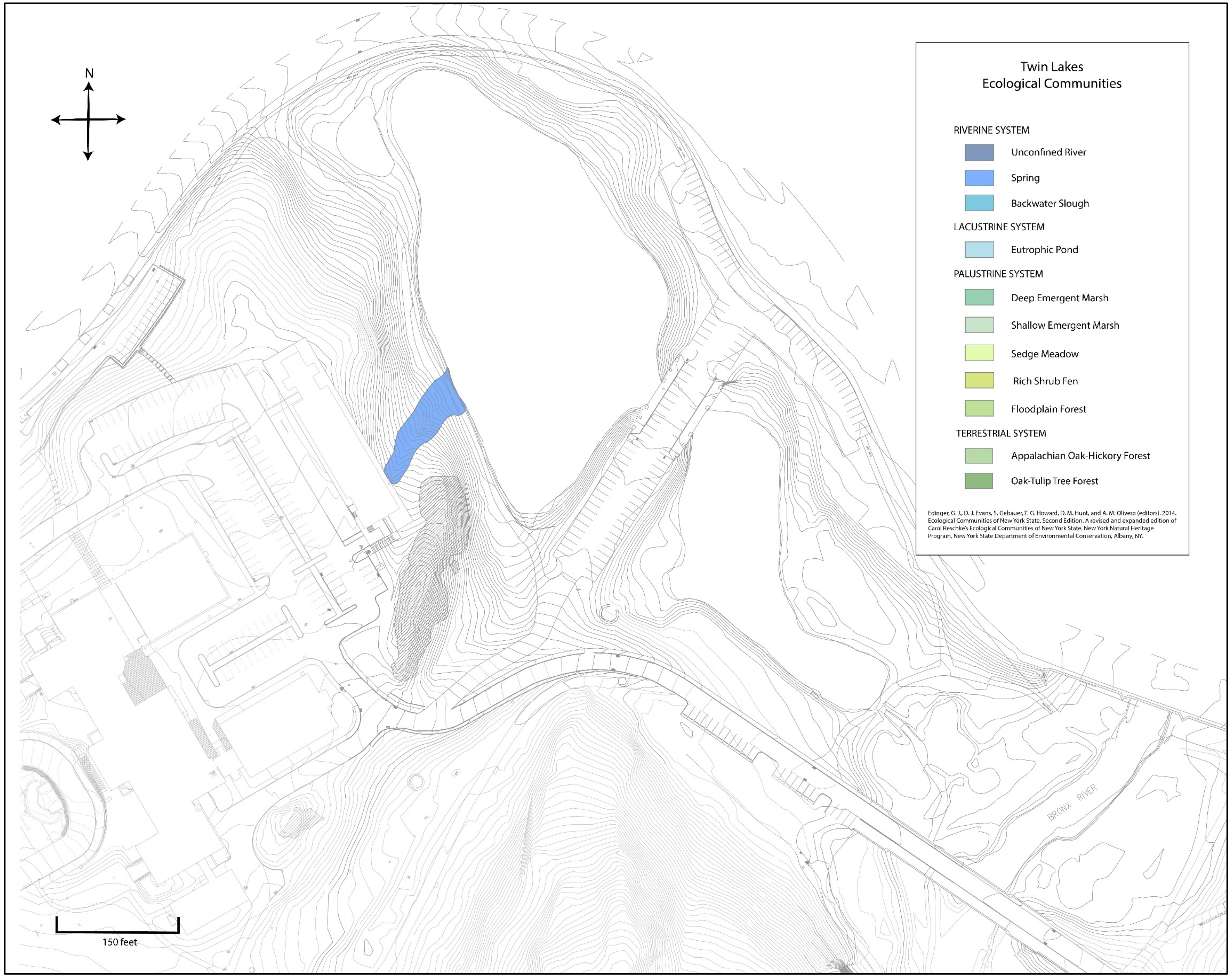
– Backwater sloughs are an aquatic community of quiet or stagnant water formed by embayments or old meanders cut off from unconfined rivers by a levee at the upstream end. They may resemble Lacustrine or Palustrine communities and may intergrade with them. This is one of the rarest habitats in New York City, occurring only along unconfined portions of the Bronx River.

– 0.51 acres

– Warm, shallow, relatively still waters are fertile breeding ground for numerous Invertebrates, including Insects, Arachnids, Annelilds, Crustaceans and Mollusks. These in turn support Amphibians, Fish, Mammals and Birds that feed on them. Aquatic plants such as Waterweed, Pondweed, and Duckweed are common. Rare or uncommon plants collected here include Hooked Buttercup (*Ranunculus recurvatus*) and Green Arrow Arum (*Peltandra virginica*).

– Especially because of its rarity and ecological importance, this community should be protected from disturbance, pollution and encorachment from invasive species. The Magnolia Way Bridge crosses over the community, providing a safe and convenient platform for observation.

SPRING



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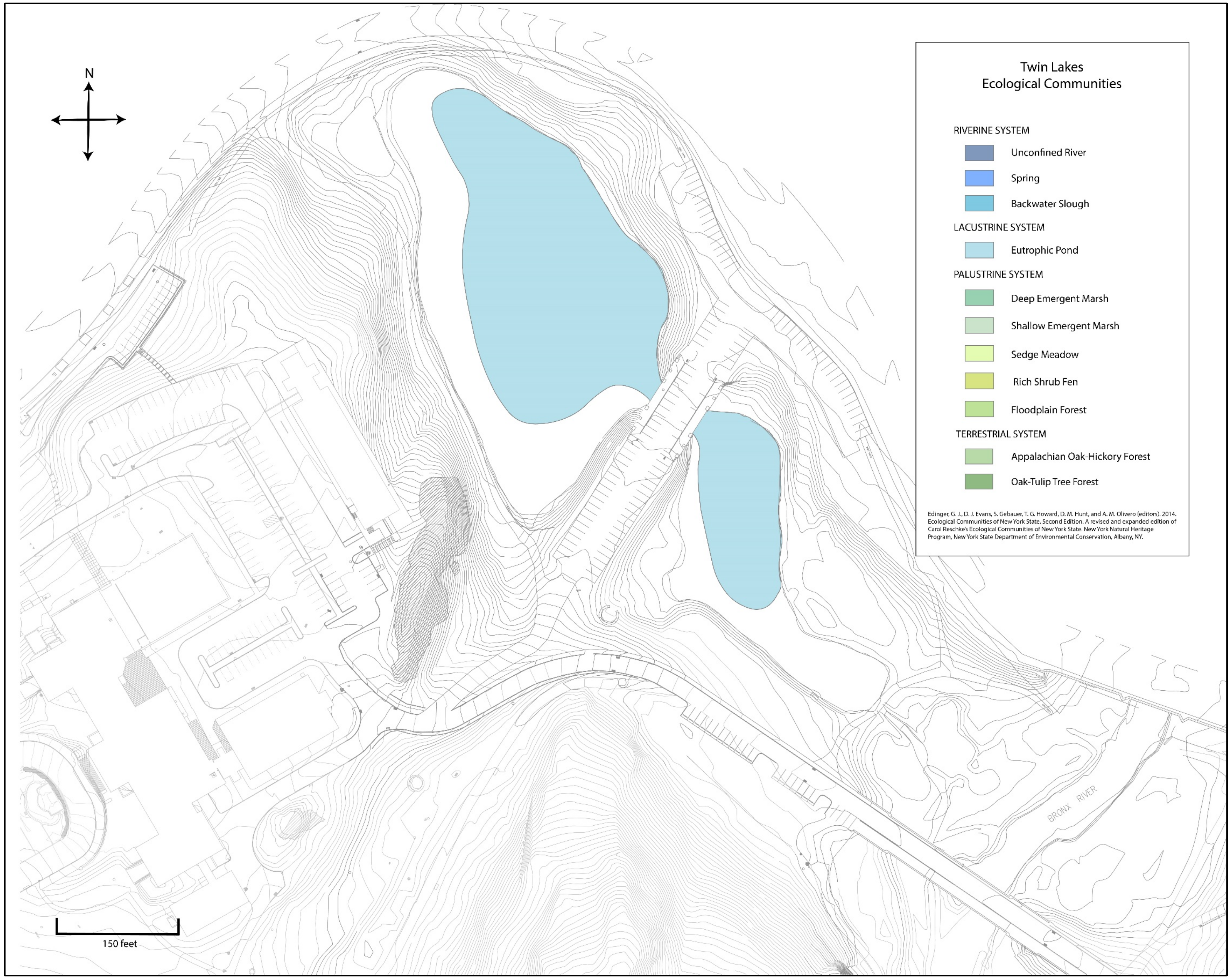
– Springs are aquatic communities of low-velocity perennial water courses with cold, pure, oxygenated water. New York City has many springs, particularly in the Bronx and Manhattan, but most are filled or piped into sewers. Springs often adjoin other communities and are an important corridor for animal migration and breeding. Springs provide a constant source of humidity helping to buffer the local climate from extreme heat or cold,

– 0.13 acres

– Fish are usually absent, but springs are important habitat for Amphibians, Insects and Mollusks and other animals that feed on them. Moisture-loving Ferns, Nettles, Sedges and Mosses often dominate the vegetation lining the spring.

– During construction, the Garden's blacksmith shop was located near the spring. In his seminal book, *Springs and Wells of Manhattan and the Bronx* (1938), James Reuel Smith bestowed the appellation "Fever Spring" for the belief that the local construction workers were sickened by drinking water from this spring. Construction of the Pfizer Lab utilized the spring channel to direct storm water away from the building.

EUTROPHIC POND



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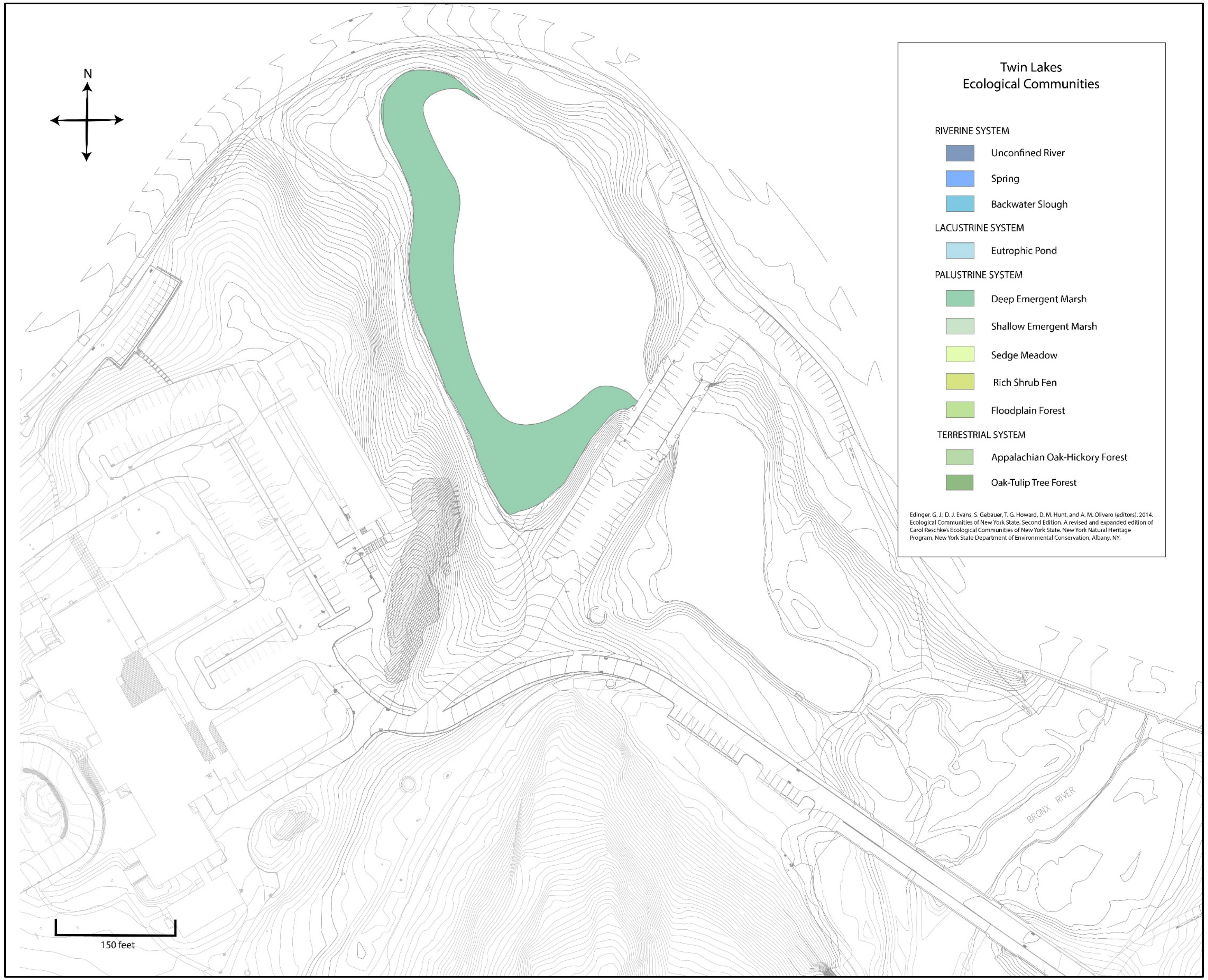
– Eutrophic Ponds are aquatic communities with shallow water and relatively stable conditions. Nutrient content is high and water is generally murky. Ecological productivity is usually very high. Ponds usually occur in a matrix of other ecological communities. The transition zones between communities can be highly dynamic.

– 1.59 acres

– Native plant and animal diversity in Eutrophic Ponds is typically very high supporting a diverse assemblage of floating and submerged aquatics including Algae, Duckweeds, Pondweeds, Bladderworts, Coontail, Waterlily, Spatterdock and many others. Ponds are important for Waterfowl who build nests along its banks an feed on aquatic vegetation. Mammals such as Muskrats, Beaver and Otters feed on the starchy roots of aquatic plants and construct their burrows and dens in or near ponds.

– Well-maintained ponds, especially in urban areas are quite rare. They are typically invaded by Phragmites and other aggressive invasive plants. Activity of wildlife, charismatic vegetation such as Waterlilies and the perennial allure of open water are priceless natural resources that should be protected and incorporated into the Garden's programming.

DEEP EMERGENT MARSH



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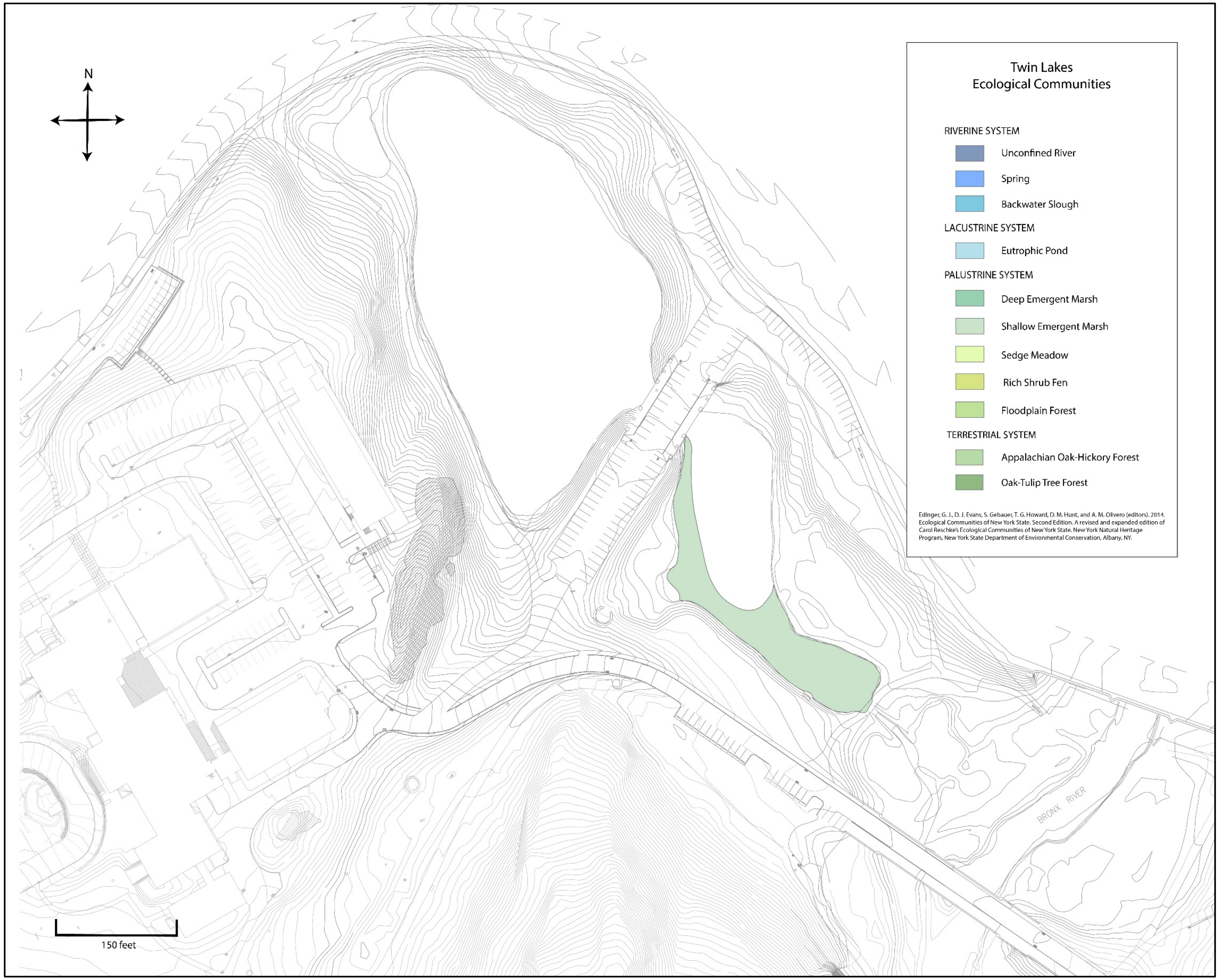
– Deep Emergent Marshes are non-tidal perennial wetlands saturated by seepage and runoff, often adjacent to ponds, lakes, rivers and springs. Water levels are usually six inches to six feet throughout the year. In natural landscapes they form continuous gradients between terrestrial and aquatic communities.

– 0.59 acres

– Marshes have very high diversity per acre. The vegetation is typically dominated by emergent aquatics such as Cattails, Wild Rice, Bur-Weeds, Bulrushes, Arrowhead, Horsetail, Pickerel Weed, Smartweeds and many others. Waterfowl feed on the Arthropods, Insects, seeds, and other abundant food sources. The tall vegetation and inaccessibility are important for wildlife, particularly Waterfowl who nest only in hidden areas inaccessible to other animals.

–The vegetation is charismatic and familiar to most people and changes throughout the season, providing abundant opportunity for study and appreciation. The Twin Lakes bridge traverses this community and will provide an ideal platform to safely observe the vegetation and the wildlife it supports. Threats to Emergent Marshes include pollution, eutrophication causing algal blooms, development, changes in the hydrologic regime and encroachment from invasive plants such as Phragmites, Purple Loosestrife, Eurasian Water Milfoil and others.

SHALLOW EMERGENT MARSH



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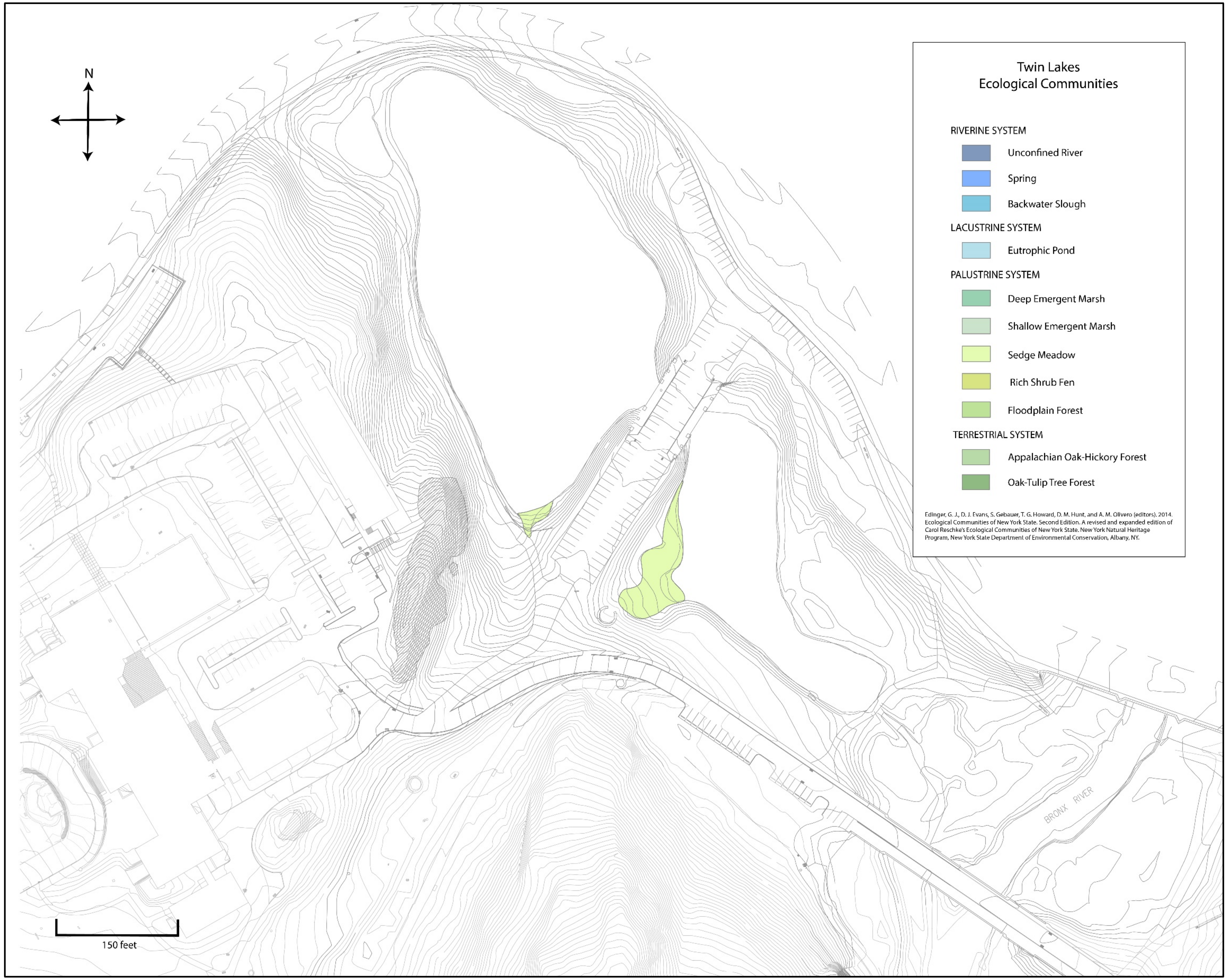
– Shallow Emergent Marshes are Palustrine communities, resembling meadows. Water levels in are typically six inches to three feet deep, but can fluctuate throughout the year, sometimes exposing the substrate. Shallow Marshes may intergrade with adjacent communities such as Sedge Meadows, Deep Emergent Marshes, Ponds, Swamps and others.

– 0.23 acres

– Plant diversity is usually very high, typically dominated by Cattails, Sedges, Rushes, Grasses, Jewelweed, Sweet Flag, Smartweeds, Arrowheads, St. John's Wort, Tall Meadow Rue, Ferns and many other species. Steeplebush and Red Maple may be occasional woody elements. The tall grasses and dense vegetation provide cover for birds such as Red-Wing Blackbirds, Marsh Wrens and others.

– High-quality marshes are rare in New York City, often becoming invaded by Phragmites, Canary Grass, Loosestrife and other invasive plants.

SEDGE MEADOW



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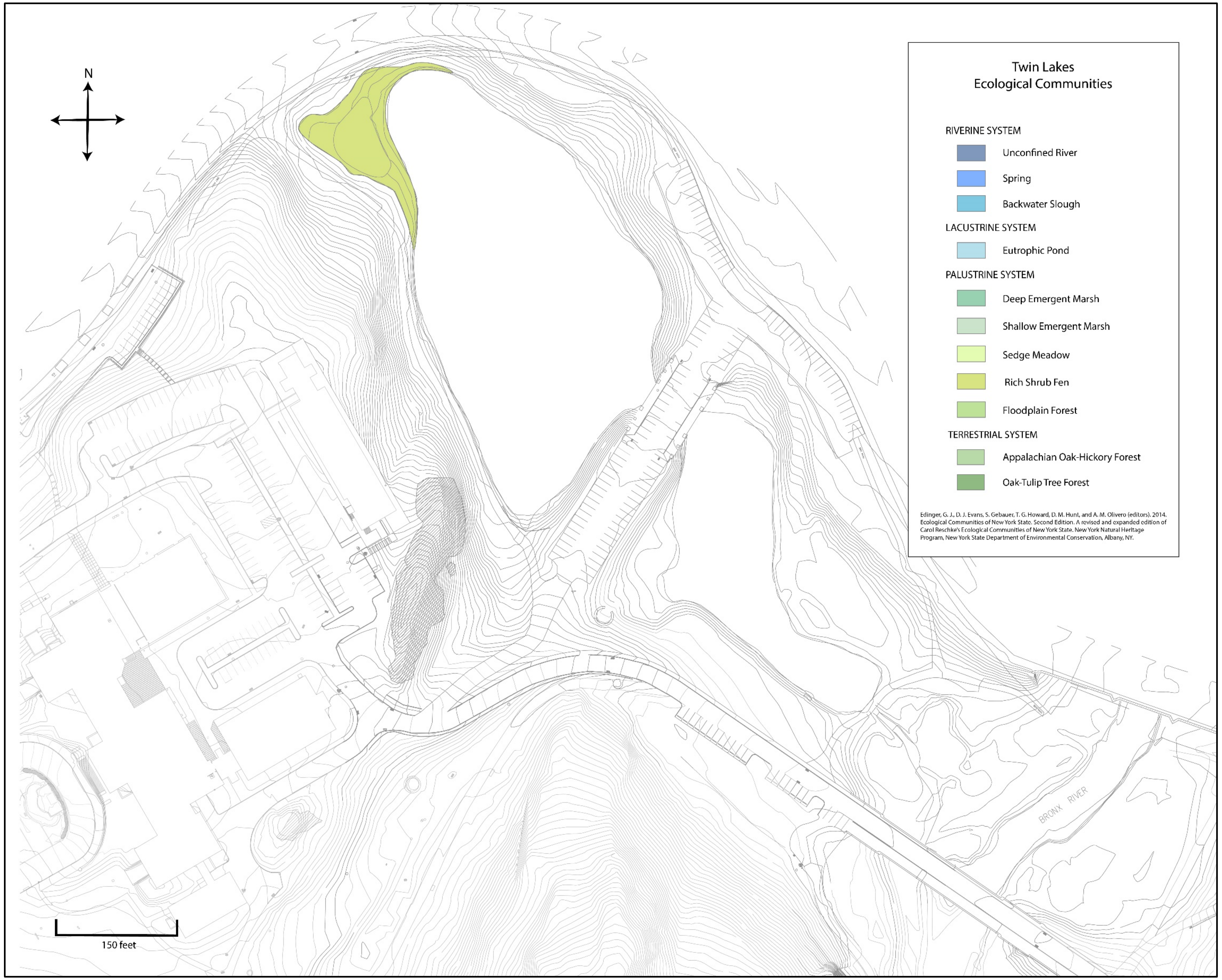
– Sedge Meadows are permanently saturated wetlands on organic peat or mucky soils, dominated by the hummock-forming Tussock Sedge (*Carex stricta*) and other sedges. Hummocks are small mounds of partially decayed rhizomes, roots and leaf bases of the Tussock Sedge and associated vegetation. Sedge Meadows often occur in mosaics of other communities.

– 0.09 acres

– The hummocks form a microenvironment for other plants and animals. They are the ideal nesting sites for Rails and Snipe. Manna Grass, Sensitive Fern, Marsh Cinquefoils, Spike Rushes and other herbs may co-dominate, Sparse shrubs such as Meadow Sweet, Steeplebush, and Alder may be present in low numbers. Numerous rare species are found in Sedge Meadows such as Northern Gama Grass, Purple Milkweed, Field Beadgrass and others.

– Sedge Meadows were drained and buried as New York City developed and are very rare in the City today. They are threatened by development, runoff carrying pollutants, nutrients and silt. Alteration of the hydrology, especially diversion of surface moisture should be avoided. Sedge Meadows are also threatened by encroachment from invasive species such as Phragmites, Purple Loosestrife, Reed Canary Grass and others.

RICH SHRUB FEN



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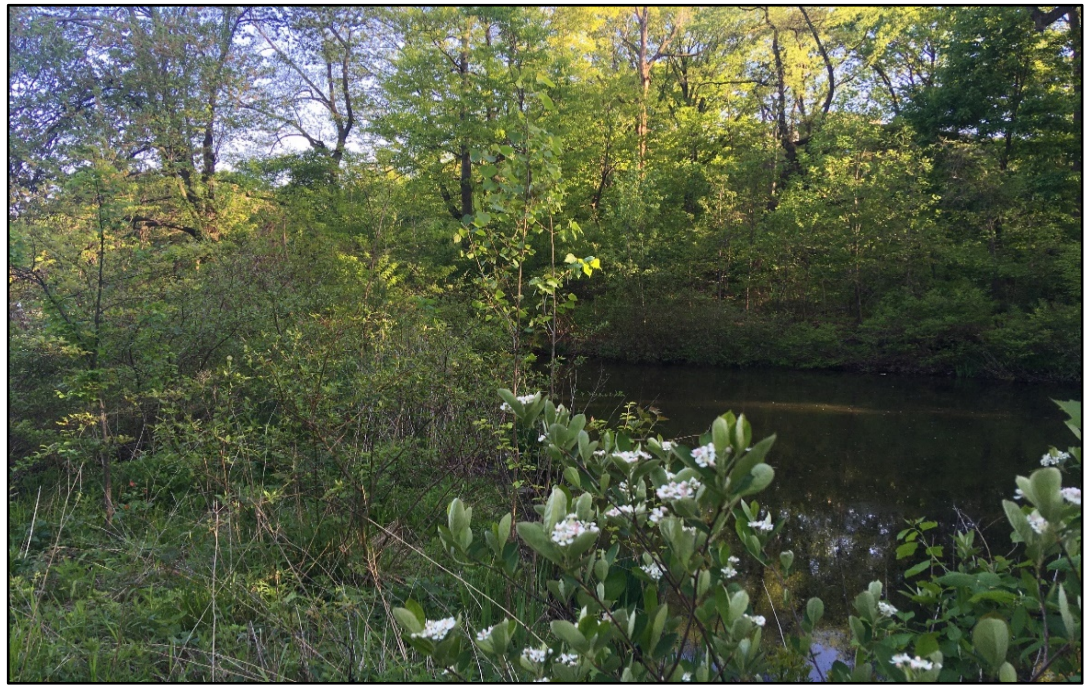
– Rich Shrub Fens are Palustrine communities dominated by woody vegetation. They occur in flooded areas with a high mineral content, usually underlain by marl or limestone. Ground water typically comes from springs and seeps, not from watercourses and is thus “rich” or “sweet”. There are only about 100 occurrences in New York State.

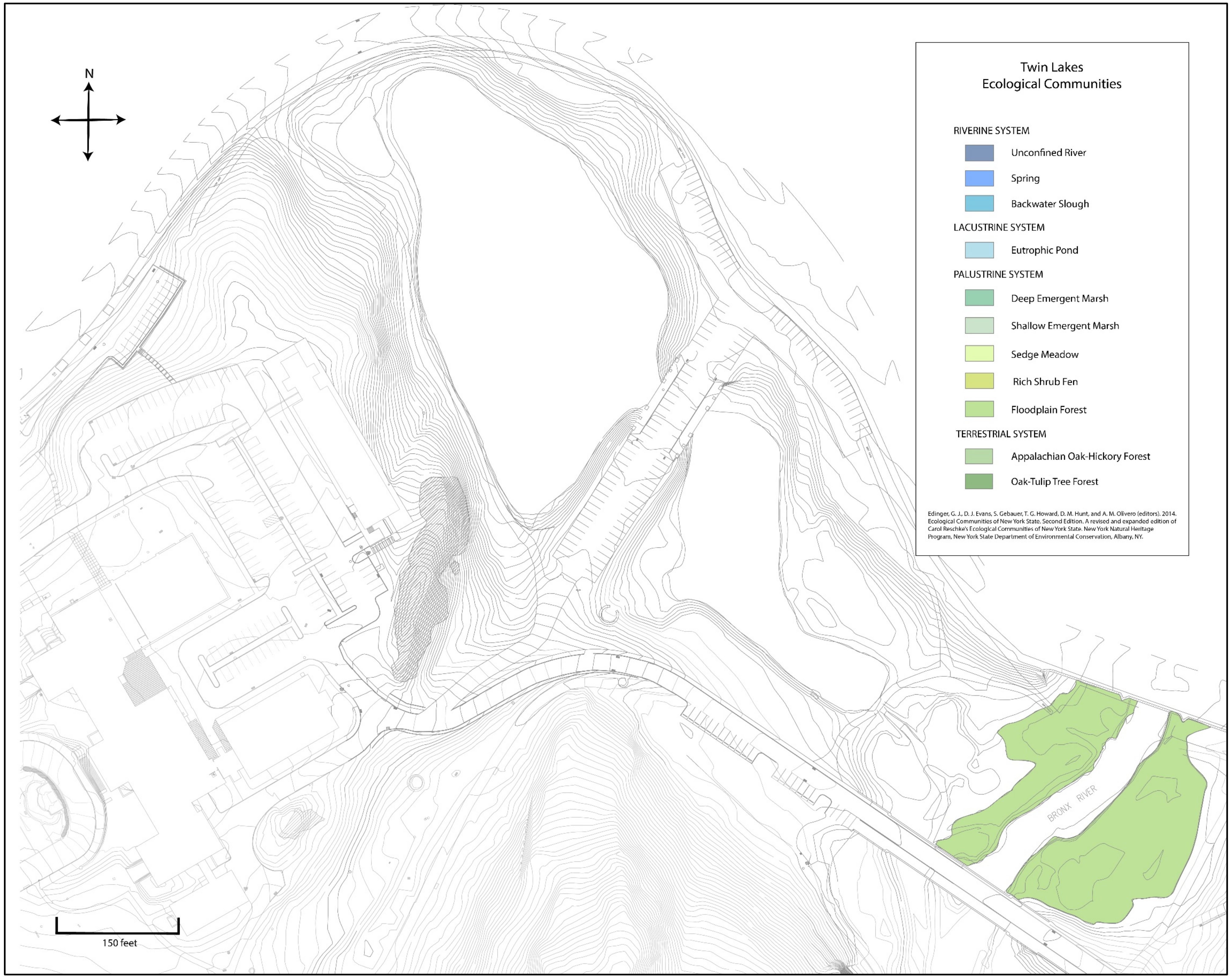
– 0.25 acres

– Plant and animal diversity is very high. The vegetation is dominated by low shrubs of diverse species, including dwarf Red Maple, Red Osier Dogwood, Speckled Alder, Black Chokeberry, Meadow Sweet, Poison Sumac, Sweet-Gale and many others. Ferns, Grasses, Sedges, Orchids and other forbs occur around the base of the shrubs. Poison Sumac was once common throughout New York City, but is now rare and occurs only on Staten Island. Fens also support a rich bryophyte flora such as Sphagnum Moss, true Moss and Liverworts.

– Fens accumulate partially decomposed vegetation called peat-- one of the most productive carbon sinks on earth. Fens are very rare in New York City. A Rich Shrub Fen adjacent to the Pfizer Plant Research Laboratory and the Watson/Library complex provides opportunity for research, conservation and education unavailable any place else in the City or perhaps New York.



FLOODPLAIN FOREST



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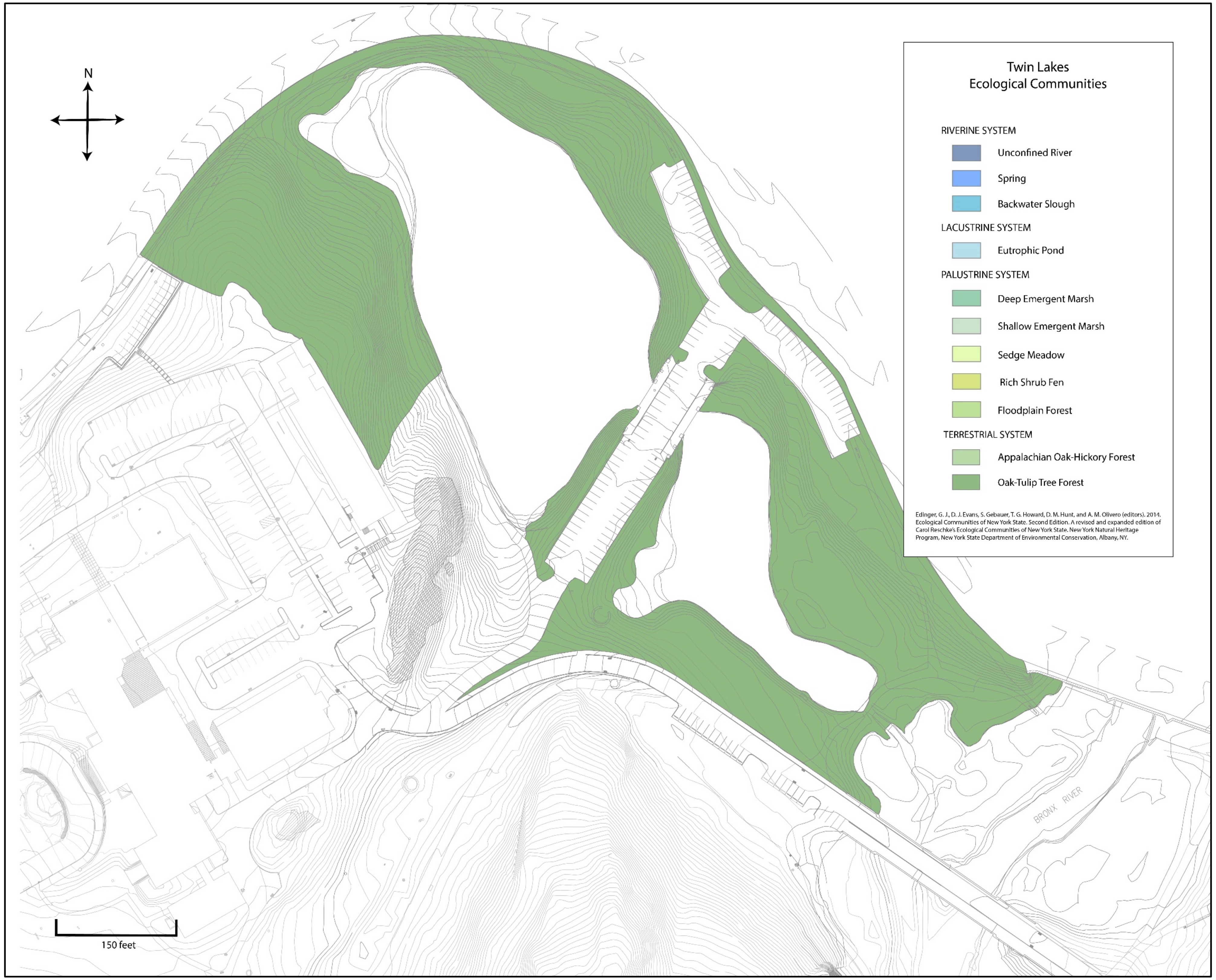
– Floodplain Forests are Palustrine communities that occur on river terraces and deltas annually flooded in spring and intermittently throughout the year. Low areas may flood more frequently especially during the summer hurricane season while high areas may only flood during extreme rainfall events. They absorb flooding and help prevent more severe impacts downstream. Floodplain forests were once common throughout New York State, but are rare today. Old-growth Floodplain Forest such as the one at NYBG are even more rare.

– 1.05 acres

– Hardwood species such as Silver Maple, Red Maple, White, Green and Black Ash, Box Elder, Cottonwood, American Elm and Slippery Elm dominate the tree canopy, while Spicebush, Viburnum and Alder dominate the shrub layer. Bird species often found in floodplain forests include Yellow throated Vireo, Red Bellied and Pileated Woodpeckers.

– Floodplain forests were some of the first to be cleared for agriculture because they produce very productive farmland. This is one of the rarest communities in New York City, occurring only along the Bronx River. The Floodplain Forest at NYBG is adjacent to an extensive Floodplain Forest in the Bronx River Forest. The communities should be managed together to ensure their integrity and full ecological value. A Floodplain Forest dominated by Silver Maples is a natural spectacle inspiring awe and reverence.

OAK-TULIP TREE FOREST



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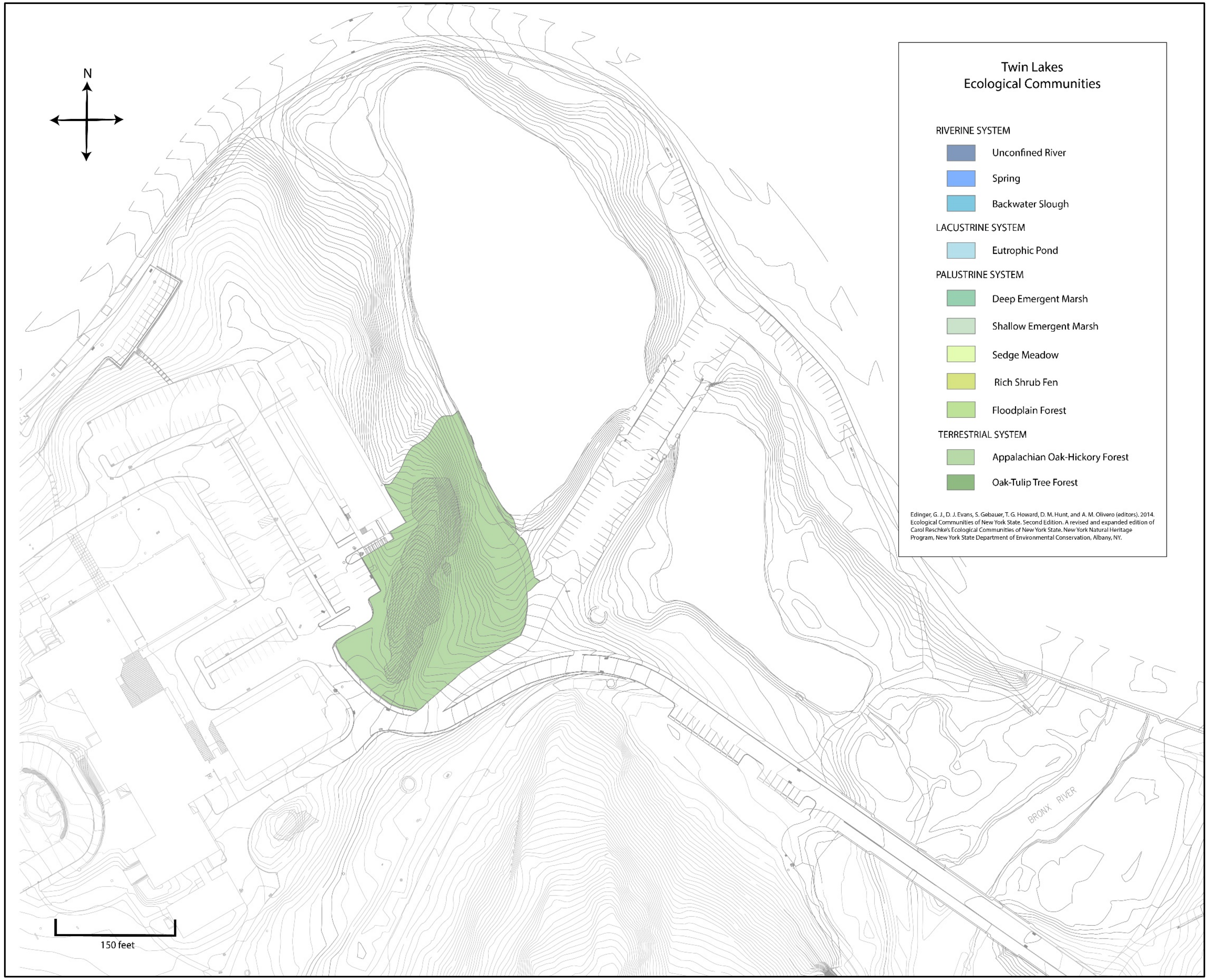
– Oak-Tulip Tree Forests are terrestrial communities that occur on moist, well-drained soils. They are dominated by hardwood species typically comprising a mixture of Oak, Birch and Maple. Oak-Tulip Tree Forests remain the dominant forest type in New York City today.

– 7.64 acres

– The dominant trees of the Twin Lakes Oak-Tulip Tree Forest are Red and Black Oaks, Tulip Tree, Sweet Birch and Sugar Maple. Sassafras, Florida Dogwood, Witchhazel, Black Cherry, Choke Cherry and Viburnum are common shrubs. The understory is dominated by a diversity of spring ephemerals including Dog-Tooth Violet, Dutchman's Breeches, Mayapple, Jack-in-the-Pulpit, Solomon's Seal and many others.

–The Oak-Tulip Tree Forest at Twin Lakes is an old-growth forest similar to the Thain Family Forest. Contemporaneous photographs and maps from the Garden's founding show a mature forest on the site. The trees themselves provide the best evidence. The stand consists of mixed age trees, including extremely large diameter mature trees (at least 200 years old) branching only in the upper reaches consistent with understory forest growth.

APPALACHIAN OAK-HICKORY FOREST



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– Appalachian Oak-Hickory Forests are a terrestrial community that occurs on rocky, well-drained sites such as ridgetops and slopes. The soils are usually loamy and neutral, neither very acidic nor basic. They are often found as a mosaic intermixed with other communities. Laying adjacent to extensive and varied wetland communities is rare.

– 0.98 acres

– Dominant trees typically include one or more Oak and Hickory species--often two or three of each. Common associates include Ash, Maple and Hornbeam. Shrubs include Viburnum, Witchhazel, Serviceberry, Blueberry and Choke Cherry. Red-Bellied Woodpeckers, Whip-Poor-Wills, Woodcocks and Turkey are frequent.

– Appalachian Oak-Hickory Forests are one of the most extensive forest communities in New York State, and were formerly dominant throughout much of New York City. Though abundant in the State, very few high-quality examples remain in New York City, most having been cut down, developed or degraded by invasive plants. Appalachian Oak-Hickory forests often have a park-like aspect with scattered trees, a rich but clear shrub layer and often a carpet of Grass, Sedge and colorful flowering perennials. A healthy canopy of Oak, Hickory, Maple and Ash trees and an understory of Blueberry and Huckelberry provide a spectacular fall display unequaled by any other forest community in our region.